

BASIC ELECTRICAL REQUIREMENTS
PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 & 28 sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Work Included: The Contractor shall perform all the Work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable electrical installation, adjusted, tested and ready for operation. The electrical work is generally described as follows:
 - 1. Coordination and scheduling.
 - 2. Demolition.
 - 3. Recycling of fluorescent ballasts and light tubes removed during demolition.
 - 4. Surge arrestors.
 - 5. Electric heaters & thermostats
 - 6. Grounding.
 - 7. Wiring devices and special purpose receptacles.
 - 8. Ancillary systems raceways, boxes, etc.
 - 9. Lighting fixtures, lamps, track, poles and bases.
 - 10. Lighting controls and devices.
 - 11. Branch circuit wiring system for lighting, outlets, equipment, etc.
 - 12. Disconnecting means, switches, receptacles, motor starters, control devices, etc. (installation only if furnished with the equipment), and final power and line voltage (120 volt

or greater) control connections to equipment and devices provided by the Owner, General Contractor or other Sub-Contractors.

13. Line voltage (120 volt or higher) control stations, devices, conduit, boxes, wiring, etc. (installation only if furnished with mechanical equipment).
 14. Replacement and modification of existing fire detection and alarm systems.
 15. New doorbell systems in hearing impaired units.
 16. Supports.
 17. Cutting and patching, core drilling, etc.
 18. Moisture, fire and dust stopping and sealing.
 19. Testing and completing.
 20. Final cleaning.
 21. Obtaining and paying for all required licenses, permits, inspections and fees.
- D. Work not included: The following electrical system related work will be provided by the Owner, General Contractor, other Subcontractors, or Systems Contractors working directly with the Owner:
1. Mechanical Contractor: Mechanical equipment and systems low voltage control wiring, conduits, devices, etc. See mechanical specification sections and schedule on drawings.
 2. Owner: Appliances, except connection of appliances shall be by contractor.
 3. Owner: Payment of utility service charges.

1.03. EXISTING CONDITIONS

- A. Before submitting bid, examine existing site (and building or equipment) conditions to determine effect on execution of the electrical work and include costs in bid.
- B. Existing circuits indicated on the plan are based on what was shown on the original building construction drawings and may not be exactly how the actual construction was done. The contractor shall expect that some amount of circuit tracing to determine how the actual circuits are installed will be required.
- C. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.

- D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- E. Restore site soils and plantings in trenching and backfilling areas and extend site restoration into adjoining areas to remain in a manner that eliminates evidence of trenching and backfilling.

1.04. PERMITS

- A. The Contractor shall submit complete sets of Fire Alarm System submittals as required to the City of Everett Fire Marshal for approval and pay the plan review fees.
- B. The Contractor shall arrange for inspections and pay for all required licenses, permits, inspections, plan review fees and any other fees.

1.05. DEFINITIONS

- A. The term "Contractor" used throughout Division 26 and all its sections of these specifications and on the electrical drawings shall be understood to mean the Electrical Contractor. All other work shall be called out by name.
- B. "Approved" means approved by the Architect. "For approval" means for the Architect's approval.
- C. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.
- D. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- E. "Provide" means furnish and install.
- F. "Remove" means to remove the existing item indicated and all associated conduit, boxes, cables, etc. to their point of origin and/or destination; except, concealed conduits and flush boxes may be abandoned in place and/or re-used in the new installation. Cables shall be removed and/or replaced.
- G. "Replace" means to remove the existing and add in lieu the new as indicated.
- H. "As directed" means as directed by the Architect.
- I. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- J. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.
- K. "C.O." means conduit only; that is, without cable (except, provide pull string or rope).

- L. "F.O.I.C." means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, systems contractors working directly with the Owner, etc.), Installed by Contractor.
- M. "N.I.C." means Not in Contract.
- N. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.06. DRAWINGS & SPECIFICATIONS

- A. The electrical plan drawings are general in form and do not attempt to show complete details or list every item of the electrical systems, the building construction or the various equipment (new or existing); however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Existing circuits indicated on the plan are based on what was shown on the original building construction drawings and may not be exactly how the actual construction was done. The contractor shall expect that some amount of circuit tracing to determine how the actual circuits are installed will be required.
- C. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.
- D. Investigate the structural and finish conditions affecting the work. Refer to the architectural, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- E. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- F. The Contractor shall bring to the Engineer's attention any discrepancies, inconsistencies, conflicts, errors, or omissions within the Contract Documents, between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. If Contractor purchases any equipment or materials and performs any construction activity, and it knows or reasonably should have known that the documents contain a discrepancy, inconsistency, conflict, error or omissions, corrective work shall be at the Contractor's expense.

- G. In the event that there are discrepancies between requirements shown on different sheets of the drawings or between the drawings and the specifications, the more restrictive of the requirements shall apply.
- H. Verify all equipment and device locations with the Owner and Architect prior to rough-in.
- I. Verify exposed raceway routing with the Owner, Architect and Engineer prior to rough-in.

1.07. SUBMITTALS

- A. Submittals from the electrical contractor and each sub-contractor shall include a cover sheet indicating the company name, project manager name, and contact information for the contractor.
- B. Forward all submittals to the Architect, together in a complete package, at one time, in bound folders or three-ring binders with cover page, index and tabs for each section. When specific approval is given, submittals may be provided in electronic format as a single .pdf file. Submittals for individual products or incomplete submittals are not acceptable and will be returned without review.
- C. Submittals shall be grouped by specification section and shall be arranged in the same order in which they are found in the specifications to facilitate the review process.
- D. Each tabbed section shall be provided with a front page with space for review comments.
- E. When specific approval is given, submittals may be sent as separate submittal packages, complete and comprehensive for each specification section.
- F. Re-submittals, when requested, shall be provided as complete and comprehensive for each specification section. Re-submittals for individual products or incomplete re-submittals are not acceptable and will be returned without review.
- G. Provide submittals for the equipment, boxes, devices, fixtures, special raceways, systems and their components, etc. as directed in the various sections of the specifications.
- H. Prepare detail layout drawings to a larger scale than the contract drawings in areas where the work is of sufficient complexity to warrant additional detailing.
- I. Submittal drawings shall be on standard size sheets no larger than the contract drawings.
- J. Submit M.S.D.S. (Manufacturer's Safety Data Sheets) for all chemicals or hazardous materials. All chemicals and hazardous materials to meet NIOSH Permissible Exposure Levels (P.E.L.) and OSHA Time Weighted Average (T.W.A.) requirements before commencing work.
- K. If requested by the Owner, provide samples of materials for evaluation.

- L. Submittals shall provide sufficient detail so compliance with the drawings and specifications can be ascertained. Clearly identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment. Catalog pages containing more than one product shall be marked with arrows to indicate the proposed product.
- M. Obtain approval before purchasing any products. Items not in accordance with the drawings and specifications will be rejected.
- N. The Contractor shall establish quantities, check drawings and data, verify space requirements, dimensions, and possible interferences prior to submittal. Submittals which indicate quantities will not be reviewed by the Engineer for accuracy of quantity.
- O. The Architect and Engineer will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.
- P. Approval of submittals does not release the Contractor from a proper installation, compliance with the drawings, specifications, codes, standards, etc. or coordination of the work.
- Q. Allow two weeks turnaround time for each submittal from the time of receipt at the engineer's office, except the engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until the related submittals are received.

1.08. SUBSTITUTE PRODUCTS APPROVAL

- A. During Bidding:
 - 1. Substitutions for equipment and materials other than that specified will be considered if equal (or better and/or higher) in quality, ratings and function; and similar in type, style, size and appearance.
 - 2. Submit written requests to Owner, Architect and Engineer.
 - a. If received no later than 7 work days prior to Bid opening, requests will be considered, but not thereafter.
 - b. Bidders will be informed by Addendum of any approved items.
 - c. No responses will be provided for rejected items.
 - 3. Requests shall be accompanied by complete specifications, samples, record or performance, certified tests by impartial, recognized laboratories, and other such information as required to clearly represent the proposed substitution.
 - 4. Lighting fixture substitution requests shall include photometric data.

5. Final decisions as to quality and suitability of proposed substitutions rest solely with the Owner, Architect and Engineer, and will be based on proof submitted.
6. The cost of changes required in order to incorporate the proposed substitution, such as revisions to controls, raceways, wiring, openings, appurtenances, etc., shall be included in the bid. Any cost reduction resulting from substitutions shall benefit the Owner through a reduced bid.
7. When Owner, Architect and Engineer approve a proposed substitution, it is with the understanding that Bidder certifies that substitute articles or materials are equal to or better than those specified and that no exception is taken with any of the performance objectives, service or warranty requirements or features herein specified.

B. After Bidding:

1. Product substitutions are allowed solely under the conditions stated in Division 1 Section "Product Requirements."

1.09. RECORD DOCUMENTS

- A. Submit record documents at completion of the project in accordance with the specific submittal requirements listed elsewhere in these documents.
- B. Provide "as-built" drawings in both full size reproducible form and in software form as AutoCAD .dwg type files.
- C. All record documents in software form shall be provided on a single CD-ROM. Include the necessary program(s) to read test results. Separate submittals for the various disciplines will not be accepted.

1.10. "AS BUILT" DRAWINGS

- A. The Contractor shall continuously maintain a marked job set of as-built drawings as the work progresses, to indicate deviations from the original design, including change orders. Maintain records of all concealed wiring and of actual equipment, device, etc. locations. Provide dimensions from accepted reference lines as needed. The as-built drawings shall be kept on-site and available for inspection by the Owner.
- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.
- C. At substantial completion, Contractor shall modify one complete set of reproducible copies, with all "as built" information and submit these drawings to the Owner for approval. Each sheet shall

be marked "CORRECTED TO AS BUILT"; or, if there are no changes, drawings shall be marked "NO CHANGES, INSTALLATION PER PLAN".

- D. After approval, Contractor shall transfer all "as built" information from the marked job set and other information as appropriate to AutoCAD .dwg type files. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.) Utilize the layering scheme, font types, line types, title block, etc. provided in the AutoCAD drawing files. All drawings shall be noted as "As-Built" with a stamp and date. After adding the "as-built" information, return the AutoCAD files to the Consultant/Engineer for inclusion into the final project record set.
- E. "As-built" drawings for all portions of the work shall be combined into a single set matching the contract documents. Separate submittals for the various disciplines will not be accepted.

1.11. OPERATION AND MAINTENANCE MANUALS

- A. Refer to Division 01, Section 01 78 23 Operation and Maintenance Data.
- B. Following installation of the electrical systems, but prior to acceptance of the work, Contractor shall submit to Architect one loose-leaf volume with information systematically segregated and indexed for easy reference to be reviewed by the Owner, Architect and Engineer. This submittal copy will be returned to the Contractor, and the material can be used in preparation of final volumes. After approval of preliminary copy, but prior to project completion, submit 3 finished copies.
- C. Format shall be 8¹/₂" x 11" size with neat, clean copies, drawings (accordion folded), etc. Manuals shall have a typewritten index, and divider sheets with identification tabs between categories. Manuals shall be in hard cover 3 ring binders with titles permanently embossed on the cover face and the spine. The front of each volume shall be imprinted with the project name, title (e.g. "Electrical Equipment and Devices Operating Instructions and Maintenance Manual"), Owner, Architect, Electrical Engineer and Contractor.
- D. Manuals shall include:
 - 1. Record documents (see above); except, full size reproducible bond paper copy of drawings to be provided separately.
 - 2. Submittals, updated to "as built" conditions.
 - 3. Test results.
 - 4. Description of systems configuration and operation including component identification and interrelations, including diagrams and supplementary drawings where necessary.
 - 5. Installation, operation, maintenance and programming manuals covering the installed systems, equipment and materials.
 - 6. Maintenance instructions (frequency of service, type of service, etc.).

7. Parts lists for all equipment; including recording information, recommended spares and anticipated useful life.
8. Supplier's names, addresses, telephone and reference order numbers for all equipment and materials.
9. Warranties and Bonds.
10. Copies of final inspection certificates from the authorities having jurisdiction.

E. Omit non-applicable data.

1.12. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. All corrective work performed by the Contractor in remedying defective work during the guarantee period following the Owner's acceptance of the project shall be subject to the same guarantee requirements of the original work for a period as specified from the date of completion of the corrective work.
- C. Corrective work shall include on-site service by the Contractor, subcontractor or supplier (e.g. fire alarm and telecommunications systems), and/or nearest technical service representative of the equipment manufacturer. Service shall be provided within 24 hours from the time of request for warranty service by the Owner.

1.13. TRAINING/INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, conduct a minimum of a one (1) hour training/instruction period at the site for each type of system to point out locations of service and maintenance and instruct the Owner's in the operation of all systems and equipment.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified representative(s) of the manufacturer with substantial training and operating experience on this equipment and project, and shall be versed in the operating theory as well as practical operation and maintenance work. Instructor(s) shall have the necessary educational and interpersonal skills, as well as proven ability to effectively perform the training. Their qualifications shall be submitted to the Owner before conducting the instruction period.

- C. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner and Engineer at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and Engineer.
- D. All training material shall be furnished and supplied by the Contractor.

1.14. QUALITY ASSURANCE

- A. The Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with the systems, equipment, devices, fixtures, materials, etc. and the required methods of installation.
- B. The Contractor shall provide proof, upon request, that all personnel are licensed according to Washington State RCW19.28.161.
- C. All materials, equipment and workmanship shall be properly inspected by the Contractor and shall at all times be subject to inspection by the Owner, Architect and Engineer. Contractor shall provide all samples, data and documents necessary for such inspection. Owner, Architect and Engineer shall be afforded full and free access at the jobsite and the shops and places of business of the Contractor for such inspection and to determine the status of the work. If Contractor covers all or any part of the work prior to any inspection or test specifically requested by Owner, Architect and/or Engineer, the cost of any necessary uncovering and replacing shall be borne by the Contractor.
- D. Neither the failure to make inspections or tests, nor to discover defective workmanship, materials or equipment, shall prejudice the rights of the Owner, Architect or Engineer thereafter to reject the work and/or require its correction.
- E. The completed installation shall comply with the more stringent of the requirements of the drawings and specifications, the authorities having jurisdiction, and all laws, ordinances, rules, regulations and requirements in effect at the site, including current editions of the following:
 - 1. NEC - National Electrical Code.
 - 2. National Electrical Safety Code.
 - 3. OSHA - Occupational Safety and Health Act (and its Washington State equivalent).
 - 4. ADA - Americans with Disabilities Act (and its Washington State equivalent).
 - 5. International Fire Code (and its Washington State equivalent).
 - 6. International Building Code (and its Washington State equivalent).
 - 7. Washington State Rules and Regulations for Installing Electrical Wires and Equipment (WAC 296-46).
 - 8. Washington State Safety Standards for Electrical Workers (WAC 296-45).
 - 9. Washington State Non-Residential Energy Code (NREC).

- F. The following standards establish the minimum requirements for the equipment and installation, unless exceeded by the requirements of the drawings or specifications:
1. ANSI - American National Standards Institute.
 2. BICSI – Building Industry Consulting Service International
 3. ICEA - Insulated Cable Engineers Association.
 4. IEEE - Institute of Electrical and Electronics Engineers.
 5. NEMA - National Electrical Manufacturers Association. 6. NEIS – National Electrical Installation Standards
 7. NFPA - National Fire Protection Association.
 8. NECA – National Electrical Contractors Association
 9. EIA - Electronic Industries Association.
 10. TIA - Telecommunications Industry Association.
- G. Nothing in the drawings or specifications shall be construed to direct or permit work not conforming to applicable laws, ordinances, rules, regulations, requirements or standards. Discrepancies or conflicts shall be brought to the attention of the Owner and Engineer promptly for resolution.
- H. The Owner and Engineer shall be advised prior to any inspection being requested. The Owner and Engineer shall be provided the opportunity to inspect the installation prior to wallboard, ceiling or finish installation. Any materials, equipment or workmanship that is not (in the opinion of the Owner, Engineer or Inspector) as it should be, shall be taken out and replaced without cost to the Owner.

PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.
- B. Contractor shall make certain that all materials selected by him, his subcontractors or by his suppliers, conform exactly to requirements of the drawings and specifications. Transmittal of such specifications and drawing information to subcontractors, person manufacturing and/or supplying materials to the project, and rigid adherence thereto, is the Contractor's responsibility.
- C. All equipment, devices, luminaires, materials, etc. shall be UL (Underwriter's Laboratories, Inc.) listed, labeled and approved for the service intended where UL standards have been established. If no UL label is available, the label of a testing agency or conformance to national standards recognized and approved by the electrical inspector having jurisdiction is required.
- D. All equipment, devices, fixtures, materials, etc. shall be new and installed only if in first class condition.

1. Unless specifically designated as existing.
 2. Existing raceways, boxes, etc. may be re-used if in "like new condition" and appropriate for the new installation.
- E. All equipment, devices, etc. and their components shall be designed for continuous duty without degradation of function or performance.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Owner and Engineer in writing prior to bidding as early as possible to allow ample time for an alternate item to be selected without delay to the project.

2.02. EQUIPMENT MANUFACTURERS

- A. Unless specifically noted otherwise, all references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
- B. All equipment, devices, materials, etc. shall be of a type manufactured by reputable recognized vendors. Each type or groups of items, system components, etc. having the same or similar function shall be the same manufacturer, make and quality throughout the facility.
- C. Approval of a manufacturer's name and/or type does not release the Contractor of the responsibility for providing materials which comply in all details with requirements in the contract documents.

2.03. SPARE CAPACITY

- A. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels, cable trays and raceways.

2.04. SUPPORTS AND CHANNEL

- A. Channel, framing members, etc. shall be 12 gauge steel, galvanized, 1⁵/₈ inch channel width with all necessary accessories.
- B. Beam clamps shall be steel, minimum 500 lb load rated.
- C. Threaded rod shall be steel, minimum ³/₈ inch diameter.
- D. Rooftop mounted conduit support bases shall be nonmetallic, UV resistant, and approved for use on the roofing material. Provide minimum 6 inches of space between bottom of conduits and roof

surface. Rooftop support bases shall be Cooper B-Line C Series (or equal) with suitable support channel.

2.05. ANCHORS AND FASTENERS

- A. Anchors and fasteners used shall be of a type designed for use in the base material to which the item is to be attached. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- B. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- C. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- D. Anchors shall be non-corrosive or have suitable corrosion resistant coatings or treatment.
- E. Bolts, nuts, screws and other threaded devices shall have standard threads and heads, unless required for tamper-proof installation.

2.06. IDENTIFICATION

- A. Provide nameplates for all equipment (e.g. switchboards, panels, disconnecting means, control panels, control stations, etc.) and other devices used for the control of circuits, equipment, etc. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.
- B. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
- C. Spare, C.O., etc. conduits shall be labeled with their destination.
- D. Nameplates shall be laminated plastic, with lettering etched through the outer covering. Character size as appropriate for the application, approved by Engineer; ¼ inch except minimum 1/8 inch. Nameplates shall be securely fastened with suitable adhesive or self tapping screws. Character and background colors shall conform to the following system color code:

<u>Background.</u>	<u>Char.</u>	<u>System</u>
Black	White	Power & Lighting

- E. Identification tags shall be plastic, flexible type with a label. Identification tags shall be securely fastened with cable ties. Tags shall be mounted so as to be clearly visible.
- F. Labels shall be heavy duty adhesive type, clear background with black letters on light colored devices and clear background with white letters on dark colored devices; except, labels on devices connected to the emergency power system shall have red letters. Lettering shall be appropriately sized for the application, ¼ inch except minimum 1/8 inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.

PART 3 - EXECUTION

3.01. CONSTRUCTION/WIRING METHODS

- A. All wire and cable shall be enclosed within the raceway system; except, "open cable wiring" will be permitted for Class 2 signal and control, fire alarm, security, telecommunications, etc. cables approved for the purpose when run concealed in an accessible location above the ceilings or in the attic.
- B. Conduit and cable shall be run concealed in the walls (including within CMU and similar construction), above the ceiling, or below the floor with all devices, etc. flush mounted; except, in the Mechanical and Electrical Rooms, conduit drops to panels, equipment, etc. may be run exposed.
- C. Equipment shall be surface mounted unless noted otherwise.
- D. Devices, etc. shall be flush mounted unless noted otherwise.

3.02. CONTRACTOR CONTROL AND SUPERVISION

- A. Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the work in a skillful manner. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.
- B. Performance of the work shall be directly supervised by a competent superintendent (and/or foreman) who is satisfactory to Owner and has authority to act for Contractor. The superintendent (and/or foreman) shall constantly supervise the work and check all materials prior to installation for conformance with the Contract Documents. The superintendent (and/or foreman) shall not be changed without the prior written consent of Owner.

- C. Contractor shall enforce strict discipline and good order among Contractor's employees and other persons performing the Work. Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons.
- D. Inappropriate activity or comments by Contractor, Contractor's employees and other persons performing the work will result in immediate removal from the site.

3.03. GENERAL

- A. The installation shall be done in a neat and workmanlike manner and shall be suitable for the location. Conduit stub-ups, sleeves and ends left open for future connection, unused hubs in fittings and unused holes in boxes shall be plugged or capped to prevent the entrance of moisture and debris.
- B. For the actual fabrication, installation and testing use only persons thoroughly trained, experienced and completely familiar with the items required and with the manufacturers' recommended methods of installation. In acceptance or rejection of the work, no allowance will be made for lack of skill or experience.
- C. Circuits shall be run from equipment to equipment, outlet to outlet, luminaire to luminaire, device to device, etc. and all homeruns shall be run as shown on the drawings unless permission is obtained from the Engineer to alter the arrangement.
- D. Changes in location (e.g. equipment and devices up to 10 feet, trench and raceway routing, cable tray locations, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.
- E. The Contractor shall conduct operations in a manner to avoid the risk of bodily harm to persons or damage to any property. Construction equipment and tools shall be in good operating condition and be designed to perform the work required. The Contractor shall continuously inspect all work to discover any unsafe conditions and be solely responsible for their correction.
- F. Use all means necessary to protect the equipment and materials and the work, materials, etc. of the other trades before, during and after installation. Do all cutting carefully to prevent damage to the work. Correct lifting, jacking and/or moving methods shall be used. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- G. The Contractor shall provide all cutting, patching, core drilling, etc. as required for the work. Use only journeymen skilled in the necessary cutting or patching operation. Patching shall match adjacent work. Structural members shall not be cut without approval of the Architect. Where penetrations in structural members for conduits, cables, etc. are allowed, the holes shall be no larger than absolutely necessary.

- H. The premises shall be kept free from the accumulation of rubbish and debris caused by the work. Dust, fibers, debris, etc. caused by the work shall be cleaned up immediately (prior to the worker leaving the area, room or space) and not tracked to other areas, rooms, spaces, etc. Cleanup shall be with a vacuum cleaner or similar provided with a proper HEPA filter.
- I. The Contractor shall move existing equipment, furniture, bookcases, boxes, miscellaneous (office, storage, maintenance, etc.) objects and materials, and other building furnishings, attached or unattached, as required to perform the work, including returning the items to their original location in their original condition.
- J. The Contractor shall remove and re-install suspended ceilings as required for installation of new raceways and cables. Damaged ceiling tiles shall be replaced by the contractor.
- K. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Architect.

3.04. PROTECTION OF PERSONS, FACILITIES & UTILITIES

- A. Unless otherwise provided by the drawings or specifications, do not cut or alter any existing utility or similar without authorization of the Owner and Engineer. The Contractor shall pay all costs, as determined by the Engineer, of remedial work necessitated by unauthorized or accidental cutting, patching, trenching, excavating, backfilling, etc. which damages and/or impairs the performance of existing utilities or similar (e.g. power, water, sewer, natural gas, telecommunications, etc.), above ground or underground, concealed or exposed, known or unknown, located or not located.
- B. All such work shall be verified with Owner and Engineer before execution of replacement, rerouting, relocation, repair or termination commences.
- C. Notify Regulating Agencies, Locator Service, Utility Companies, Engineer and Owner's Project Manager a minimum of a minimum of fourteen (14) days in advance and re-confirmed a minimum of 48 hours in advance, or as mutually agreed upon with Owner, prior to commencement of any such work. Submit procedures to assure safe and continuous operation of the utilities for approval.
- D. Proceed with sufficient caution to preclude damaging any utilities or similar (e.g. power, water, sewer, natural gas, telecommunications, etc.), above ground or underground, concealed or exposed, known or unknown, located or not located. In the event unidentified utilities are encountered, notify the utility, Owner and Engineer.
- E. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.

3.05. COORDINATION AND SCHEDULING

- A. The Contractor shall coordinate the work and cooperate with the Owner, other trades and System Contractors to have the work completed to the best advantage, insure there are no interferences, provide reasonable opportunity for the other trades and Contractors to complete their work and to not delay the work.
- B. Contractor shall coordinate work to avoid disturbance to building operations and personnel, and to allow access for both persons to and within all portions of the facility and vehicles to the facility. Access to office spaces, apartments, etc. will not be allowed when they are occupied.
- C. Contractor shall schedule all equipment, utility, electrical, telecommunications, fire alarm, fire protection, etc. interruptions with the Owner in accordance with the scheduling requirements listed elsewhere in these specifications.
- D. Any and all costs incurred for non-standard hours, double-shifts, overtime, etc. or any other costs associated with completing the project within the completion times required shall be included without increase in contract sum.

3.06. DELIVERY, STORAGE AND HANDLING

- A. All equipment and materials shall be stored neatly and out of the way. Conduit, fittings, cable, etc. shall be stored off the ground, protected from the weather in racks or bins or on shelves. Equipment, panelboards, fixtures, devices, etc. shall be stored indoors in a dry, warm area, free of dust and one in which condensation will not occur.
- B. Ship equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations and packing label instructions. Provide protective coverings during construction.
- C. Following installation, protect materials and equipment from corrosion, condensation, physical damage, and the effects of moisture. Keep openings in boxes or equipment closed when work is not being done in them during construction.
- D. Identify materials and equipment delivered to the site and storage organized to permit checking against approved material lists and submittals.

3.07. DEMOLITION

- A. Where existing equipment, fixtures, devices, etc. are indicated to be replaced, remove and dispose of the existing and provide new in its place.
- B. Dispose of fluorescent light tubes and lighting ballasts in accordance with Division 02 Section 02 80 03 Removal of Ballasts and Light Tubes.
- C. For all items indicated as to be removed or re-wired, Contractor shall remove all associated conduit, boxes, cables, etc. back to their point of origin &/or destination; except, concealed

conduits & boxes may be abandoned in place &/or existing conduits & boxes may be re-used if in good condition & appropriate for the new installation, at the option of the Contractor. Existing cables shall be removed or replaced.

- D. Existing equipment, fixtures, devices, etc. to remain shall be protected as required during demolition and construction. In the event of damage, immediately make all repairs and/or replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- E. Items not indicated shall remain "as is"; except, shall be re-connected as required if its circuit is interrupted during the demolition.
- F. Holes, openings, etc. where existing raceways, cables, boxes, outlets, etc. are removed and not replaced shall be patched to match adjacent surface.
- G. All surplus materials removed during the demolition shall be inspected by the Owner and those items selected shall remain the property of the Owner. All remaining surplus materials shall be removed from the site and disposed of by the Contractor without increase in Contract Sum.

3.08. INTERRUPTIONS

- A. Power, fire alarm, telecommunications and other systems interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Power, fire alarm and/or telecommunications interruptions required to facilitate construction work and that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard or longer than standard hours will be required, without increase in Contract Sum. Also, see Section 01500.
- B. Change-over of individual items shall be done 1 at a time.
- C. As much as possible, items shall be pre-assembled and systems prefabricated to minimize the change-over time.
- D. Shutdowns will not be allowed to extend beyond the time Contractors personnel are present.

3.09. LOCATIONS

- A. Locations and mounting heights of equipment, devices, etc. shall be consistent, and in accordance with the requirements of NFPA, ADA and the authority having jurisdiction.
- B. Devices and associated wallplates shall be located so as to not span different types of building finishes.

- C. In general, surface raceways, cable trays, cable racks, etc. shall be mounted as unobtrusively as possible, tight against whiteboard trim, chair rails, in room corners, against ceilings, against chases, etc. and other breaks in the construction.
- D. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.
- E. Changes in location (e.g. equipment and devices up to 10 feet, trench and conduit routing, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.

3.10. EQUIPMENT, LUMINAIRES AND DEVICES

- A. Equipment, luminaires, devices, etc. shall be installed plumb and true, and shall be square with the adjacent walls, ceilings, structural members and other equipment; in a horizontal or vertical position as intended. The location of similar items shall be consistent.
- B. Light standards (poles), luminaires, etc. shall be set to stand plumb and true and shall be square with the adjacent buildings, property lines, sidewalks, roadway, etc.
- C. The correct lifting, jacking and/or moving gear which will prevent damage shall be used.
- D. All bolts, nuts, screws and other fastenings shall be tightened in accordance with manufacturers or listing instructions and all covers replaced on equipment and boxes. All electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity.
- E. Follow manufacturer's installation details wherever available. Provide supports, boxes, mountings, wiring, fittings, etc. as required, standard or special. Wherever any conflict arises between manufacturer's instructions, codes and regulations, and these Contract Documents, follow Owner's decision.
- F. Following installation, protect materials and equipment from corrosion, condensation, physical damage, and the effects of moisture. Keep openings in boxes or equipment closed when work is not being done in them during construction.
- G. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc. Check for proper fit.

3.11. SUPPORTS

- A. Provide all necessary supports, anchors, fasteners, and backing for all raceways, cable trays, cable racks, boxes, enclosures, fixtures and equipment.

- B. Hangers and supports shall be made from standard structural shapes and hardware or systems of shapes, fittings and hardware designed for the purpose.
- C. Hangers and supports shall be adequately and safely attached to the building structure. Equipment or materials to be supported shall be securely fastened to the supporting means. Use size and number of attachments as required for a safety factor of at least four. In addition to the weight of the material, consideration shall be given to the weight of the support itself, the weight of materials within, vibration, external operational forces, shock load, etc.
- D. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.

3.12. APPROVALS

- A. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways, cables, etc. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.
- B. Prior to beginning installation of cables, obtain approval of concealed raceway installation from the Owner, Architect and Engineer.
- C. Prior to beginning installation of cables, obtain approval of the raceway installation from the Owner, Architect and Engineer.

3.13. CLEANING

- A. Remove trash, combustible material, and other debris from electrical rooms and areas around equipment.
- B. Remove shipping materials, supports, spacers, etc. from equipment, devices, etc.
- C. Remove all debris from equipment, devices, etc. including all scraps of wire, metal shavings, plaster, dust, and other foreign material.
- D. Clean screens, louvers, baffles, etc. covering ventilation openings to ensure they are clear.
- E. Remove paint splatters and other spots, dirt, and debris.
- F. Touch up scratches to match original finish.
- G. Remove all traces of soil, dirt, dust, smudges, fingerprints and other foreign matter from visible surfaces of equipment, devices, luminaires, etc. Pay close attention to highly finished surfaces such as glass and polished metals. Wipe lamps clean.

- H. Maintain adequate ventilation during cleaning.
- I. Follow manufacturer's instructions. Failure to follow manufacturer's recommendations when cleaning equipment can result in damage from the use of improper cleaning methods or agents.

3.14. VISUAL AND MECHANICAL INSPECTION

- A. Visually check the equipment, its components and associated raceways, conductors, etc. for proper grounding and bonding. Ensure that grounding and bonding terminal bars, bus bars, straps, and conductors are properly connected.
- B. Verify that cables do not contact live parts and that cables are properly secured to withstand the effects of fault currents.
- C. Check equipment anchorage, mounting, clearances, alignment and fit of components.
- D. Check that phase barriers are in place, if applicable.
- E. Visually check disconnect switch blade alignment, blade penetration, travel stops, and mechanical operation.
- F. Operate equipment and components (e.g. disconnect switches, circuit breakers, etc.) to insure smooth operation.
- G. Compare all circuits (internal and external) with wiring and/or control diagrams to verify they are installed correctly.
- H. Confirm that equipment nameplates and safety labels are provided.

3.15. TESTING

- A. The Contractor shall perform all tests required in the various sections of the specifications and in accordance with manufacturer's recommendations. Record test results and include in operation and maintenance manuals.
- B. The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.
- C. All testing shall be performed by personnel that are trained in the specific task to be performed
- D. Do not proceed with tests until previously identified deficiencies are corrected.
- E. Test equipment in accordance with manufacturer's recommendations. Maintain test results for future comparisons. Include in operation and maintenance manuals.

- F. All systems shall test free from shorts and grounds and shall be without mechanical and electrical defects. If any test indicates a failure, in the opinion of the Engineer; the item shall be replaced or suitably repaired to the approval of the Owner, Architect and Engineer, and the test repeated without additional cost to the Owner.

3.16. COMMISSIONING

- A. Refer to other related sections of the specifications for additional requirements, including Division 1 Specification Sections and applicable provisions of the other Divisions.
- B. The Contractor shall provide all test equipment, instruments, tools, etc. as required. Test equipment, instruments, tools, etc. shall be fully operational and properly calibrated.
- C. All commissioning and testing shall be performed by personnel that are trained and fully qualified in the specific task to be performed.

3.17. CONTRACT CLOSE-OUT

- A. As a requirement for substantial completion of the Work, the Contractor shall thoroughly check the installation. Checking shall consist of visual inspection and manual adjustment to confirm correct installation and arrangement and to assure the intended function, response and operability. Checking shall include, as a minimum, the following:
 - 1. Check that equipment, devices, etc. are of the correct type and rating.
 - 2. Check that all raceways, fittings, devices, boxes, enclosures, etc. are secure and that all conduit connections are tight.
 - 3. Check that all electrical connections are correctly tightened.
 - 4. Check that equipment, devices, panelboard circuit directories, etc. are correctly labeled.
 - 5. Check that equipment, fixtures, devices, etc. are clean with all unnecessary labels removed.
- B. As a requirement for substantial completion of the Work, the Contractor shall:
 - 1. Obtain final inspections from the authorities having jurisdiction.
 - 2. Perform final cleaning.
 - 3. Submit approved "As Built" Drawings, Record Documents, Test Records, Manuals, etc.
 - 4. Submit written warranty statements for equipment, materials and installation.
 - 5. Conduct system tests.

- C. After the requirements for substantial completion have been met, the contractor shall notify the Engineer in writing that the Work is substantially complete. The Engineer will then perform a final inspection of the installation and issue a "punchlist" for final completion.
- D. The Contractor shall complete the work on the punchlist or provide written explanation for not completing the work. The punchlist shall be signed by the contractor and returned to the Engineer when complete.
- E. The Engineer will re-inspect the Work to verify that all the items have been completed.
- F. The above process shall be completed a single time for the project. If additional punchlist and inspection cycles are required to be completed due to the contractors failure to complete items on the punchlist, the contractor will be backcharged for the Engineer's additional services on time and material basis through the construction contract.
- G. Subsequent to final completion and testing operations, instruct Owner's authorized representatives as required in operation, adjustment and maintenance of equipment and systems.

End of Section 26 00 10

**COMMON WORK RESULTS FOR ELECTRICAL
PART 1 - GENERAL**

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

PART 2 - PRODUCTS

2.01. RACEWAYS

- A. Raceways, where required, shall be of the types listed below, unless noted otherwise:
 - 1. Electrical Metallic Tubing (EMT) – Concealed above grade and exposed in Utility Rooms and other Non-Public Areas not readily visible to building occupants, except as noted below.
 - 2. Surface Metal Raceway System (SMR) – Exposed in Public Areas, Offices, Rooms, Corridors and the like where readily visible to building occupants.
 - 3. Flexible Metal Conduit (FLEX) - final connections to vibrating equipment and for fixture whips. Also, FLEX may be substituted for EMT for branch circuits between wiring devices and boxes concealed inside frame walls and ceilings. FLEX shall not be used for any homeruns, conduit stub-ups into accessible ceiling spaces, nor for any exposed or surface conduit runs except as final connections to vibrating equipment.

- B. Raceways shall be sized so that the cable fill does not exceed 40%; except, minimum conduit sizes shall be as follows:
 - 1. $\frac{1}{2}$ inch - runs with 3 or fewer #12, or smaller; except flex shall be minimum $\frac{3}{4}$ inch.
 - 2. $\frac{3}{4}$ inch – above grade branch circuits, ancillary systems circuits or similar, except as noted below.
 - 3. $\frac{3}{8}$ inch - fixture whips furnished by the manufacturer with the fixtures.
- C. Electrical metallic tubing shall be electro-galvanized steel.
- D. Flexible metal conduit shall be helically wound galvanized steel, type FMC; except outdoors, liquidtight flexible metal conduit shall have a liquidtight, non-metallic, sunlight-resistant jacket over a flexible galvanized steel metal core, type LFMC. Flexible conduit connections shall be a minimum of 18 inches long.
- E. Surface metal raceways shall be heavy-gauge zinc plated or galvanized steel; Wiremold or Mono-Systems series 500, 700, 2000 or larger as required or approved equal. Color shall be manufacturer's standard color closest to matching surface color as possible.

2.02. RACEWAY FITTINGS

- A. Fittings for steel conduit shall be steel, galvanized or cadmium plated, threaded type. Couplings shall be galvanized steel. Locknuts and bushings shall be galvanized steel.
- B. Connectors, couplings, etc. for EMT shall be steel set-screw type; except, steel raintight compression type in potentially wet or damp locations (e.g. outdoors).
- C. Fittings, mounting brackets, etc. for surface metal raceways shall be grounding type, of the same manufacturer and specifically designed for the purpose and use with the particular type of raceway. Telecommunications surface metal raceway system fittings (and power surface metal raceway fittings when installed adjacent to the telecommunications raceway) shall have rounded corners to allow telecommunications cables a minimum 2 inch bending radius without reducing the raceway cable fill capacity. Fittings for non-standard angles less than 90° shall be field bent/fabricated as required. Angles, bends, etc. in raceways greater than 90° and inserts into the raceways providing the 2 inch bend radius will not be allowed. Color shall match raceways.
- D. Sleeves connecting surface metal raceways on opposite sides of walls shall be as detailed on drawings.
- E. Fittings for flexible metal conduit shall be of a type specifically designed for the purpose.

2.03. BOXES

- A. The use of exposed boxes in areas readily visible to building occupants shall be kept to a minimum. Except in telecommunications raceways, use conduit outlet bodies (e.g. T, LB, LR, etc.) at conduit intersections unless specifically noted or approved otherwise.
- B. Boxes shall accommodate any devices to be installed and shall be sized as required by the applicable codes for number and size of conduits and cables entering and leaving; except minimum as noted below.
- C. Indoor boxes above grade in dry locations shall be nail-on plastic type, except cut-in type where cut into existing walls.
- D. Surface mounted boxes installed in wet or damp locations and outdoors shall be threaded rigid body type, cast aluminum or galvanized iron.
- E. Unless noted otherwise, boxes installed in wet or damp locations and outdoors shall be threaded rigid body type, cast aluminum or galvanized iron.
- F. Surface metal raceway system boxes shall be of the same manufacturer and specifically designed for the purpose and use with the particular type of raceway and/or device to be mounted onto the box. Color shall match raceways.
- G. Unless noted otherwise, larger size pull and junction boxes shall be fabricated from code gauge galvanized steel.
- H. Unless noted otherwise, larger size pull, splice and terminal boxes shall be fabricated from code gauge galvanized steel, with full access screw type cover unless noted otherwise. Sizes shall be as required, except minimum as indicated. Terminal boxes shall be provided with power distribution type terminal blocks, with main and branch lugs sizes and quantities as required.
- I. Switch, power outlet, device, etc. boxes shall be single or ganged to accommodate the required number of devices. Boxes containing multiple devices shall be minimum $2\frac{1}{8}$ inches deep. Flush mounted boxes shall be equipped with plaster rings and suitable wallplates. Surface mounted boxes shall have raised surface type covers.
- J. Ancillary systems (e.g. fire alarm, security, etc.) outlet, device, junction, etc. boxes shall be in accordance with the requirements of the respective supplier; except, minimum as specified above.
- K. Unused flush mounted boxes, including existing abandoned in place, shall have blank wallplates or ceiling box type covers. Color shall match existing surface paint color as close as possible with manufacturer's standard colors.
- L. Openings in boxes, etc. through which cables are intended to pass shall be provided with suitable nonmetallic grommets.

2.04. WIRE AND CABLE

- A. Wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to NEC, system, load, voltage drop, etc. requirements.
- B. All wire and cable (power, control, ancillary systems, etc.) shall be suitable for wet or dry locations, in conduit, above ground and underground.
- C. Branch circuit cable, above grade feeder cable and equipment ground cable, where run in raceways, shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #12 AWG; except, fixture whips provided as an assembly by the fixture manufacturer with the fixtures may be #14 AWG. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors may be solid.
- D. Type NM cable shall consist of multiple individually insulated circuit conductors (with 600 volt type THHN insulation) and a bare grounding conductor bundled together with fillers as necessary, binder tape and PVC jacket wrapped around the assembly, type NM-B. NM cable shall be suitable for installation in dry locations, at maximum conductor temperatures of 90°C. Conductors shall be stranded, except #12 AWG and smaller lighting and general purpose receptacle branch circuit conductors may be solid. The minimum conductor size shall be #14 AWG.

2.05. CABLE SUPPORTS

- A. Cable ties shall be utilized in panelboards, etc. to group and support conductors. Multi-wire branch circuits shall be grouped together as required. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- B. Type NM cable shall be supported and secured by staples, straps, hangars or similar fittings designed and installed so as to not damage the cable. Type NM cables shall be supported at intervals not exceeding 4 feet and within 12 inches of every box, cabinet or fitting.

2.06. LOW VOLTAGE CONNECTIONS AND TERMINATIONS

- A. Taps and splices shall be kept to a minimum.
- B. Taps and splices in #8 AWG, and smaller, branch and fire alarm circuit cable shall be made with twist-on spring type wire nuts. Taps and splices in telecommunications cables, ancillary systems cables, larger branch circuit cables, feeder cables, control cables, etc. or below grade will not be allowed without specific approval from the Engineer.
- C. Fittings for type NM cable shall be of a type specifically designed for the purpose.

PART 3 - EXECUTION

3.01. RACEWAYS

- A. Raceways and cables shall be run concealed in the walls (including within CMU and similar construction), soffits (new and existing), above the ceiling or below the floor unless indicated otherwise. Exposed raceways shall be run as neatly and unobtrusively as possible, to the approval of the Owner, Architect and Engineer.
- B. Raceways shall be installed straight, plumb and true and shall be without kinks or sags.
- C. Exposed raceway runs shall be either parallel or at right angles to walls and structural members, as neatly and unobtrusively as possible (e.g. adjacent to window and door trims and base, at wall/wall or wall/ceiling intersections, etc.). Exposed parallel or banked raceways shall be run together.
- D. Raceways shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All raceways shall be kept a minimum of 6 inches away from items producing heat.
- E. Above grade raceways, fittings, etc. shall be securely supported from permanent structural members of building, either directly or indirectly. Raceways shall be fastened at intervals of 8 feet, nominally, and within 36 inches of each outlet, fitting, panel, etc. Caddy clips or wire ties using not less than No. 14 wire and "ladder-ties" which will prevent displacement, may be used only for concealed runs of EMT or GRS to 1¹/₂ inch. Single runs of exposed conduit shall be supported with steel pipe straps.
- F. Bends in raceways shall be made without flattening, kinking or reducing the cross-sectional area of the raceway. Bends in parallel or banked runs shall be made from the same center line so that the bends are parallel.
- G. All raceway cuts shall be made square with a proper cutting tool. The inside and outside of all raceway ends shall be reamed after cutting and/or threading to eliminate burrs and rough edges, then wiped clean. Joints shall be cut square and shall butt solidly into couplings. Running threads will not be permitted.
- H. Surface metal raceways shall be cut with a factory manufactured and/or approved cutting tool designed/made specifically for the purpose.
- I. Raceways shall be closely and tightly fitted in couplings, connectors, boxes, etc. to provide an electrically continuous low resistance ground fault return path. Threaded joints shall be made up with at least 5 threads fully engaged.
- J. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before or pulling any cable.

- K. Exposed raceways shall be painted.

3.02. EXCAVATION AND BACKFILLING

- A. Excavate to depths noted, and as required for proper completion of all below grade work and cut to sufficient size to provide ample room for construction of forms, shoring and bulkheads as required.
- B. Cut existing asphalt, concrete, etc. as required. Push under existing curbs, sidewalks, etc. where possible.
- C. Underground utilities (electrical, water, sewer, cable television, etc.) are known to exist in the area of construction. The location of existing utilities shown on the drawings is approximate only and is not guaranteed to be an indication of all utilities in the area. The contractor is responsible for contacting the Owner and all utility companies and for field location of all utilities prior to construction. The one-call number for underground utility location services is 811 (1800-424-5555). The Contractor shall promptly notify the Engineer of any conflicts between the contract documents and field location of existing utilities. The Contractor is responsible for maintaining the integrity of all existing utilities during construction.
- D. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.
- E. Provide a spotter at all times when excavation occurs by use of a backhoe, excavator or other mechanical equipment.
- F. Shore and brace excavations where necessary to prevent cave-ins and in accordance with all safety laws and codes.
- G. During excavations and backfilling, extreme care shall be taken to keep rocks and other rough material away from conduits and cables. Pack a minimum of 6 inches of soft fill material (free from stones, rocks and other rough material that might be forced against the conduits and cables during backfilling, or when settling or frost-heaving disturbs the surrounding earth) around conduits and cables. Wash in to avoid air gaps.
- H. Backfill shall be good compactable material without large rocks, chunks or sticks. Backfill in all excavations shall be progressively compacted in maximum 12 inch lifts to 95% of maximum density, and shall be without voids.
- I. Prior to excavation, the Contractor shall mark or otherwise show the location of all equipment and vaults, and obtain specific approval from the Owner and Engineer for the location of each prior to installing equipment, boxes, raceways, etc.
- J. Maintain all bench marks, control monuments and stakes, whether newly established by Surveyor or previously existing. Protect from damage and dislocation. If necessary to disturb existing benchmark, re-establish in a safe place.

- K. The clearance between the underground conduit systems and other underground items, such as water and sewer lines shall be as large as necessary to permit maintenance of any of the systems without damage to the other items.
- L. Keep all excavations, pits, trenches, etc., entirely free from water. Protect excavations from rain or water from any source during construction. Use suitable pumping equipment or other means as required by conditions. Continue pumping as necessary until completion of work.
- M. When operations are interrupted by unfavorable weather conditions, prepare areas by grading and compaction to avoid ponding and erosion.
- N. Dirt shall not be permitted to accumulate on roads or adjacent green belts, nor to be washed into drainage ditches.
- O. Appropriate steps, such as the application of water, shall be taken to prevent airborne dust due to the work, particularly during excavation and moving of materials.
- P. Trenches, excavations and any damage to adjoining areas shall be repaired/restored to existing or better condition to the approval of the Owner, Architect and Engineer.

3.03. BOXES

- A. Boxes shall be installed plumb and true and be firmly supported either directly or indirectly by a sound and safe structural member of the building with approved anchors and fasteners, and shall be readily accessible for maintenance.
- B. Pull boxes or fittings shall be provided in conduit runs as required to prevent excessive stress on the cables during pulling and to allow the minimum required bending radius.
- C. Where an accessible ceiling space exists, locate above the ceiling; otherwise locate in an unobtrusive location to the approval of the Architect, Engineer and Owner.
- D. Pull boxes shall be provided at the transition between the surface metal raceway system and conduit or "open" cabling system. Where an accessible ceiling space exists, locate above the ceiling; otherwise locate in an unobtrusive location against the ceiling.

3.04. WIRE AND CABLE

- A. All wire and cable shall be enclosed within the raceway system; except:
 - 1. "Open cable wiring" approved for the purpose shall be permitted for Class 2 signal and control circuits, fire alarm system cable, telecommunications cable, etc. when run concealed in an accessible location above the ceilings.

2. Type NM Cable (Romex) may be substituted for EMT for branch circuits concealed inside walls and ceilings within the dwelling units only. Type NM cable shall not be used exterior of the buildings, or be exposed.
- B. Wire and cable shall not be exposed to weather or mechanical damage longer than necessary. Cut ends of the cable shall be immediately sealed to protect from moisture. Duct tape is not an acceptable means of sealing.
- C. Cable shall be unrolled from reels, or removed from cartons, and installed so as to not damage the insulation or cable sheath and in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Use only guides, rollers, sheaves, etc. that are freeturning and clean. Cable shall not be dragged on the ground or over sharp edges or abrasive surfaces. Slack wire shall be provided at all pull points.
- D. All cables to be installed in a raceway shall be pulled together. The pulling means (fish tape, cable, rope, etc.) shall be of a type that will not damage the raceway.
- E. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway system shall be complete, snaked and cleaned before pulling any cable.
- F. "Open" ancillary systems cables, low voltage control cables, etc. shall be bundled and be supported from permanent structural members of the building, either directly or indirectly, with suitable rings or hooks. Support spacing shall not exceed 5 feet. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. Support "open" cables a minimum of 6 inches above T-bar ceilings. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Tape and cable ties are not approved methods of fastening cables.
- G. Provide conduits, boxes, etc. for all "open" cable wiring where penetrating from one floor to the next and through rated fire walls.
- H. Protect "open" cables during installation. Provide suitable covers on supports, structural members, etc. with sharp edges. Remove all added coverings, protection, etc. after installation of the cable.
- I. Provide wire/cable markers (Brady type or equivalent/better) identifying its circuit number and/or final destination on all cables/conductors (power, telephone/computer, and other ancillary systems) at panels, devices, junction points, etc.
- J. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- K. Conductor connections shall be made with connectors of the proper size and type. Compression connections shall be made with the correct die and number of crimps, or the correct tightening torque in the case of mechanical connectors, according to manufacturer's instructions and recommendations. Use suitable oxide inhibiting joint compound on all aluminum terminations.

Termination of insulated conductors shall be made so that the stripped length of bare conductor is not longer than required for the terminal or connector. Care shall be taken to not nick conductors during insulation removal.

- L. At pulling points, the cables shall be neatly bundled by circuit.
- M. Taps and splices shall be kept to a minimum; and are not allowed in cables larger than #8 AWG, control cable, ancillary systems cable, etc. and below grade without prior approval from the Engineer.
- N. Field wiring shall not contact live parts.
- O. Cables shall not be supported by their terminations. Suitable cable ties and/or supports shall be utilized in switchboards, panelboards, terminal boxes, junction boxes, vaults, etc. to group and support conductors. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- P. Insulated cable supports shall be provided to relieve any strain imposed by cable weight or movement, and to secure cable as required to withstand the effects of fault currents.

3.05. PENETRATIONS

- A. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Architect.
- B. Provide conduit sleeves where cable trays pass through fire-resistive walls, partitions, etc. Sleeves size and quantity shall provide the same capacity as the cable tray.
- C. Floor and ceiling penetrations by "open" cables and/or cable trays will not be allowed.

End of Section 26 05 00

GROUNDING AND BONDING
PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 & 28 Sections apply to all the grounding work.
- B. Coordinate grounding work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

PART 2 - PRODUCTS

2.01. SWITCHBOARDS AND PANELS

- A. Provide both ground and neutral bars in panels. All connectors and lugs shall be solderless, pressure type suitable for copper or aluminum wire.

2.02. WIRE AND CABLE

- A. Ground wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to NEC, system, load, voltage drop, etc. requirements.
- B. Equipment ground cable shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation. Conductor size shall match feeder, branch circuit, etc. conductor size unless noted otherwise. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors may be solid.

PART 3 - EXECUTION

3.01. GROUNDING

- A. All electrical equipment, enclosures, boxes, devices, etc. shall be provided with a ground fault return path by means of an insulated grounding conductor installed with the circuit conductors, and the integrity of the raceway system if applicable. Bond raceway system as required.
- B. Ground terminals of all equipment, devices, etc. shall be grounded by the equipment ground conductor.
- C. Connections shall be both mechanically and electrically secure. Torque connecting hardware in accordance with the manufacturer's instructions and recommendations.

End of Section 26 05 26

THERMAL AND MOISTURE PROTECTION

PART 1 – GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 & 28 Sections apply to all the thermal & moisture protection work.
- B. Coordinate thermal & moisture protection work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the Work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for all moisture, fire and dust stop materials, complete with a description of where each type is proposed to be used.

PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.

2.02. FIRE STOPPING AND SEALING MATERIALS

- A. Fire-stop systems shall be designed and installed to allow the passage of cable, conduit or pipe through fire rated walls or floors. They shall provide a barrier seal to prevent the penetration of fire, smoke, water, and gases, with a fire rating to match the rating of the architectural assembly or structure to be penetrated.

- B. Fire-stop systems shall be resistant to direct hose spray.
- C. Fire-stop systems shall consist of one or more of the following materials:
 - 1. Ablative (typical of silicone-based technology).
 - 2. Cementitious (Can be troweled like grout or mortar, but is specifically rated for the purpose. Grout shall not be permitted).
 - 3. Elastomeric (Flexible substance which resembles rubber).
 - 4. Endothermic (Absorbing heat energy.).
 - 5. Intumescent (Swelling under the influence of heat, pillows, etc.).
 - 6. Mechanical (Assemblies that allow additions or deletions).
- D. Fire-stop systems shall be UL classified for the intended use.
- E. Wall, ceiling and floor sleeves and the like shall be metallic raceways with intumescent bags or bricks; except, at the option of the Contractor, sleeves may be metallic wireways (sized to match the required raceways) which contain an intumescent insert material that adjusts automatically to cable additions or subtractions, Specified Technologies EZ Path, 3M Fire Barrier Pass-Through, or approved equal.
- F. Fire-stop material around cable penetrations, within raceways (except wall and floor sleeves), etc. shall be intumescent bags, bricks, or soft, pliable, non-hardening intumescent putty, with high dielectric strength (insulator). Material shall allow removal of the material(s)/system(s) for future cable additions and/or removals.
- G. Drywall joint compound, concrete, and mineral wool shall not be used as fire stopping materials.
- H. Fire-stop products shall be as manufactured by 3M, Dow Corning, Hilti, Nelson, Specified Technologies, Unique Fire Stop Products, or approved equal.

2.03. DUST SEALING MATERIALS

- A. Dust seal systems shall be designed and installed to allow the passage of cable, conduit or pipe through non-rated ceilings, walls, partitions or floors.
- B. Dust sealant around raceways and the like shall be top grade paintable silicone based or polysulfite caulk, or expanding foam type sealant.

- C. Dust sealant around cable penetrations, within raceways, etc. shall allow removal of the material for future cable additions and/or removals.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Provide all fire-stop sealing for all penetrations through fire-resistance-rated floors, walls and partition construction; including empty openings and openings containing cables, raceways, cable trays, cable racks, sleeves, supports and other penetrating items as required, both new and existing where new cables, raceways and the like have been installed. Contractor is responsible for verifying the fire rating of the barrier to be penetrated.
 - 1. Install fire-stop systems in accordance with manufacturer-tested methods and to manufacturer's instructions. If required, extend fire-stop system through the full thickness of the wall or floor and through the full length of the sleeve.
 - 2. Seal openings with a removable fire-stop material after each shift. Do not leave unattended openings in building fire-resistance-rated walls, partitions and floors at any time during construction.
 - 3. Fire-stopping at penetrations between tunnels and buildings shall include smoke isolation provisions to prohibit smoke migration from one space to the other.
- B. Where sleeves or penetrations are installed through non-rated partitions, provide a dust seal to prevent dust from migrating between the spaces separated by the partition. Also, where fire stop material does not completely fill an opening (e.g. intumescent pillows), provide suitable dust sealant as required.
- C. Where existing sleeves or penetrations are re-entered for installation of new cables, Contractor shall modify/re-install or provide new fire stop material as required to maintain the original fire rating of the barrier.

End of Section 26 07 00

**ELECTRICAL TRANSMISSION
PART 1 - GENERAL**

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 & 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Circuit breakers.
 - 2. Panels.
 - 3. Wiring devices & wallplates.
 - 4. Wall heaters.

PART 2 - PRODUCTS

2.01. PANELS

- A. Panels shall be dead-front, circuit breaker type loadcenters. Branch circuits shall be arranged using double row construction. Interiors shall be rigid and so designed that circuit breakers can be replaced, changed or added without disturbing adjacent units and without machining, drilling, or tapping.

- B. Busses shall be copper or tinned aluminum. Ground and neutral bars shall be provided. All connectors and lugs shall be solderless, pressure type suitable for copper or aluminum wire.
- C. Panels shall all be of the same manufacturer, Square D Homeline series, no substitutions, to match existing.
- D. Circuit breakers from the existing loadcenters shall be removed and re-installed in the new loadcenters as indicated on the panel schedules.
- E. Circuit breakers shall be plug-on in, molded-case, thermal magnetic, quick make-quick break type with trip indicating handles. Branch circuit breakers for motor loads shall be HACR type. Branch circuit breakers for lighting loads shall be SWD type. Multi-pole breakers shall be singlehandle, internal common trip. Tandem breakers shall not be used.
- F. Circuit breakers supplying dwelling unit circuits shall be Arc-Fault interrupting type.
- G. Panels and circuit breakers shall be fully short circuit rated. Series rating of circuit breakers will not be allowed.
- H. Ground fault protection systems shall include current sensors and all necessary relaying and tripping components. The current sensor shall enclose all phase and neutral conductors. Ground fault relays shall be of solid state design with adjustable pickup and time delay settings, be selectively coordinated between the main and feeder relays, and shall include test provisions.
- I. Spaces shall be bussed for the maximum device that can be fitted into them, and shall be equipped with mounting and connecting accessories for future installation of circuit breakers.
- J. Panels shall be suitable for top and bottom entry of feeder and branch circuit conduits, cables, etc.
- K. Panels and each feeder breaker in each (clearly and accurately identifying the function and location) shall have laminated plastic master nameplates.
- L. Panels shall be provided with warning nameplates to warn personnel of potential arc flash and shock hazards in compliance with the NFPA 70E standard. Nameplates shall include the voltage system, arc flash boundary limits and PPE category specific to the location.
- M. Panels shall have a circuit directory frame and card with a transparent cover furnished on the door. Directory cards shall have a typewritten index clearly and accurately identifying the function and location (using the room name and numbering system shown on the Architectural plans) of the circuit. Provide new typewritten circuit directory cards for all existing panels that are modified in any way.
- N. Circuit directory cards shall be arranged to match the physical arrangement of the breakers, with odd numbered circuits on the left side of the card and even numbered circuits on the right side of the card. Where required due to the size of the directory frame, the odd numbered circuits

may be on a separate card from the even numbered circuits. Odd and even numbered circuits shall not be intermingled together.

2.02. WIRING DEVICES

- A. Wiring devices shall be specification grade, all of the same manufacturer, ivory colored.
- B. Fan variable speed switches will be furnished by the Mechanical Contractor, and shall be installed by the Electrical Contractor.
- C. General purpose receptacles shall be 15 amp, 125 volt, AC, straight blade, 3-wire grounding type.
- D. Ground fault interrupter (GFI) type receptacles shall be duplex, Class A, 15 amp, 125 volt with end of life protection (either by rendering itself incapable of delivery power or by visual indication) and reverse line-load miswire protection. Provide individual ground fault interrupter type receptacles at each location indicated or as required.
- E. Lighting switches shall be toggle, AC quiet type rated 15 amps, 120-277 volt.
- F. Timer switches shall be electronic 7-day programmable type, with LCD display and manual control, rated 12 amps and 1 H.P. at 125 volts AC. Intermatic model EJ600, or equal.
- G. Thermostats shall be 2-pole, 240 volt, 16 amp, programmable with LCD display, and front accessible control buttons. Thermostats shall be King model K702E-2, or approved equal.
- H. Flush mounted devices (including telecommunications) shall have smooth specification grade high abuse nylon wallplates, color to match devices.
- I. Surface mounted devices shall have raised surface type covers, galvanized steel.

2.03. WALL HEATERS

- A. Wall heaters shall be electric, heavy-duty fan forced type with finned metal sheath element, permanently lubricated totally enclosed motor and without thermostat. Enclosure shall be semirecessed with minimum 18 gauge welded steel louvered grill.
- B. Wattage rating shall be as indicated on the drawings.
- C. Wall heaters shall be Cadet Com-Pak series for heaters 1500 watts and below, and Cadet ComPak Twin series for heaters 2000 watts and above, no substitutions, to match existing.

2.04. PLUGS & CONNECTORS

- A. Plugs (cord ends) shall be of the type, ratings and design for the use intended, NEMA configuration.
- B. Plugs (cord ends) shall be black and white nylon constructed, with separately molded face, single piece ribbed housing and screw connected strain relief cord holder. Plugs shall be suitable for use with the associated cord, and shall have the NEMA configuration and manufacturer model number durably molded into the plug housing.
- C. Plugs (cord end outlet box) shall be yellow, non-metallic constructed box, impact and crush resistant with cord strain relief, two duplex receptacles, minimum (or as noted on the drawings), yellow cover plates, gaskets and flip lids. Plugs shall be suitable for use with the associated cord and stainless steel mesh cord relief.

2.05. EQUIPMENT IDENTIFICATION

- A. Provide nameplates for all equipment and other devices used for the control of circuits, equipment, etc. Include the panel and circuit number(s) from which it is fed.
 - 1. Separately mounted circuit breakers.
- B. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and, where applicable, include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents.

PART 3 - EXECUTION

3.01. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Devices shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All devices shall be kept a minimum of 6 inches away from items producing heat.
- C. Disconnect switches, circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6¹/₂ feet above the floor or working platform.
- D. Outlets (power, telecommunications, etc.) shall be mounted 18 inches to centerline above finished floor unless noted otherwise; except, outlets above counters, etc. shall be mounted 6 inches to centerline above the counter or 3 inches to centerline above the splashboard, whichever is higher.

- E. Locate light switches, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor. Where light switches are adjacent to countertops, install the switches at the same height as adjacent devices above the countertop.
- F. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and obtain specific approval from the Owner and Architect for the location of each prior to installing enclosures, boxes, raceways, etc.

3.02. EQUIPMENT AND DEVICES

- A. Equipment, devices, enclosures, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members.
- B. Equipment, cabinets, boxes, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.

End of Section 26 20 00

